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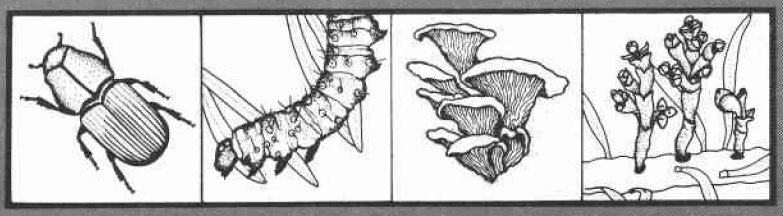
Forest Pest Management



Report 86-5

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February 1986

PROGRESS REPORT ON THE SPRUCE BUDWORM SILVICULTURAL DEMONSTRATION PROJECT ON THE GALLATIN AND LOLO NATIONAL FORESTS

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by

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A demonstration of silvicultural prescriptions to reduce damage caused by western spruce budworm was established in 1981 (Bousfield et al. 1983). The purpose of this effort was to show:

1. How different cultural systems affect budworm populations.
2. How various cultural systems alter stand response in the presence of spruce budworm.
3. How unmanaged stands respond to budworm defoliation.
4. How well the CANUSA-developed decision system predicts various outcomes for each cultural system.
5. How cost effective various cultural systems are using economic models coupled with growth models that incorporate effects of spruce budworm.

Since establishment of the demonstration areas in 1981, only the Gallatin NF stands received the cultural cuts and have been regenerated. The Lolo NF stands were cut in 1985 and monitoring plots will be established following slash disposal in 1986. Budworm populations have been low on the Lolo and light to moderate on the Gallatin demonstration stands. This report is confined to the Gallatin demonstration area (fig. 1).

METHODS

Stand examinations were conducted on all blocks prior to logging. A series of systematic sample points using variable plot sampling for trees greater than 5 inches d.b.h. and 1/300-acre plot for trees 5 inches and less were established in each stand to determine stand structure. Pretreatment stocking levels are displayed in Tables 1 and 2.

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Figure 1.--Location of cutting blocks.

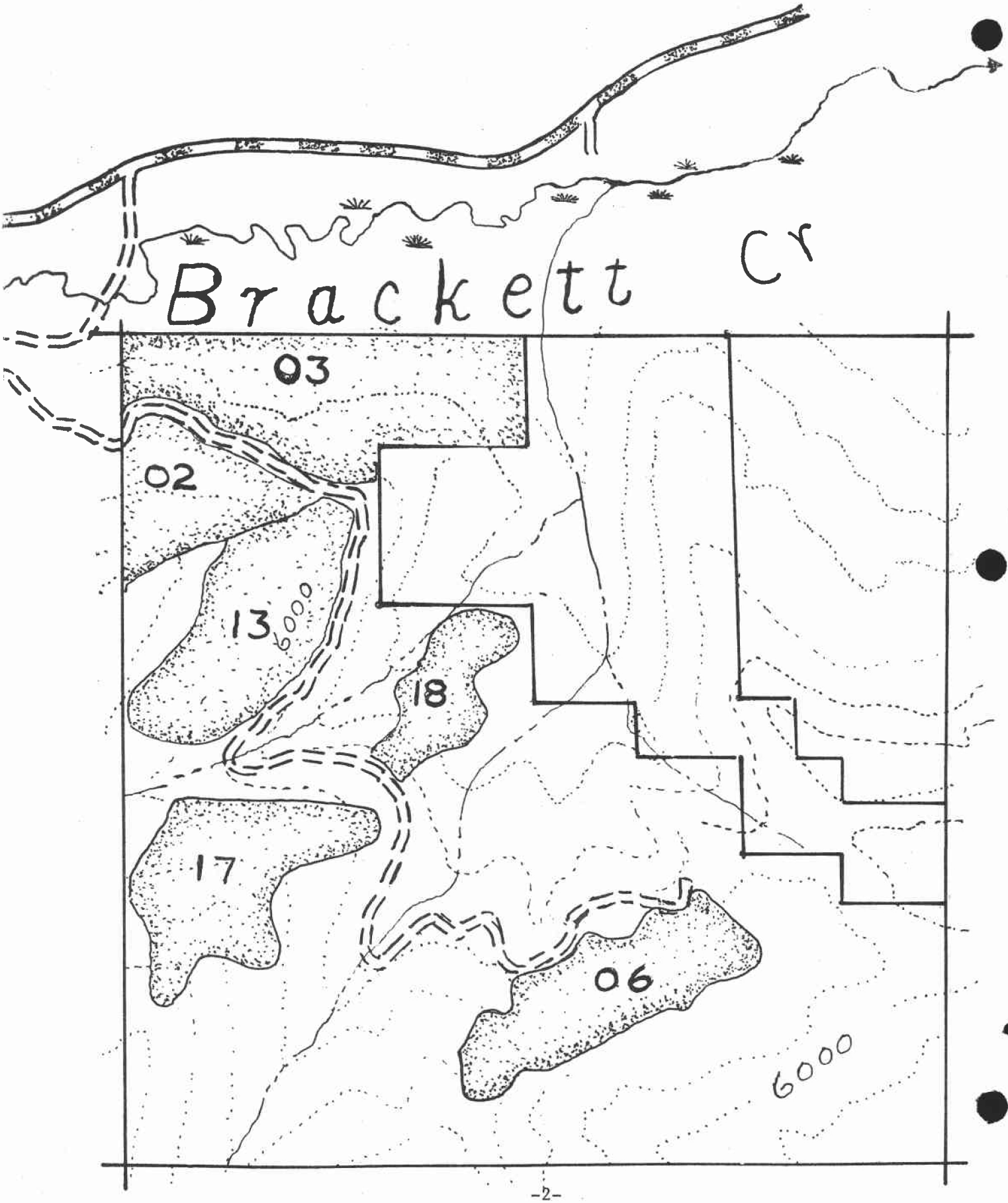


Table 1.--Pretreatment basal area stocking levels.

	Stand ident.	Gallatin National Forest Basal area by species				
		DF	S	SAF	LPP	Total
Check	02	182.8	0	0	33.3	216.1
Group selection	03	48.5	13.6	13.4	140.3	215.9
Clearcut	06	176.8	6.7	0	53.3	236.8
Shelterwood	13	171.1	0	0	0	171.1
Shelterwood	18	94.8	0.1	0.2	46.7	141.8
Overstory removal	17	61.4	0	1.8	37.0	100.3

Table 2.--Pretreatment trees per acre stocking levels.

	Stand ident.	Gallatin National Forest Trees per acre by species				
		DF	S	SAF	LPP	Total
Check	02	1491.2	9.0	300.0	101.2	1892.5
Group selection	03	528.6	807.1	1169.9	384.4	2889.8
Clearcut	06	1694.3	7.9	50.0	83.2	1835.4
Shelterwood	13	1319.5	0	0	0	1319.5
Shelterwood	18	1242.7	250.0	300.0	64.4	1857.2
Overstory removal	17	1242.7	100.0	100.0	186.3	844.7

Posttreatment evaluations used similar sampling techniques to measure stocking levels (Tables 3 and 4). At each sample point, a wooden stake was placed to mark plot center. Each sample tree was numbered with paint and an aluminum nail was placed at breast height facing plot center. Location of these points within each block are shown in figure 2.

Table 3.--Posttreatment basal area stocking levels.

	Stand ident.	Gallatin National Forest Basal area by species				
		DF	S	SAF	LPP	Total
Check	02	150.7	6.0	6.8	48.8	211.9[1]
Group selection	03	63.5	0	0.5	10.0	74.0
Clearcut	06	0	0	0	0	0
Shelterwood	13	78.4	0	0	0	78.4
Shelterwood	18	38.0	0	0	0	38.1
Overstory removal	17	29.4	0	9.4	10.0	48.7

[1]Additional plots and different systematic grids were used when posttreatment plots were established.

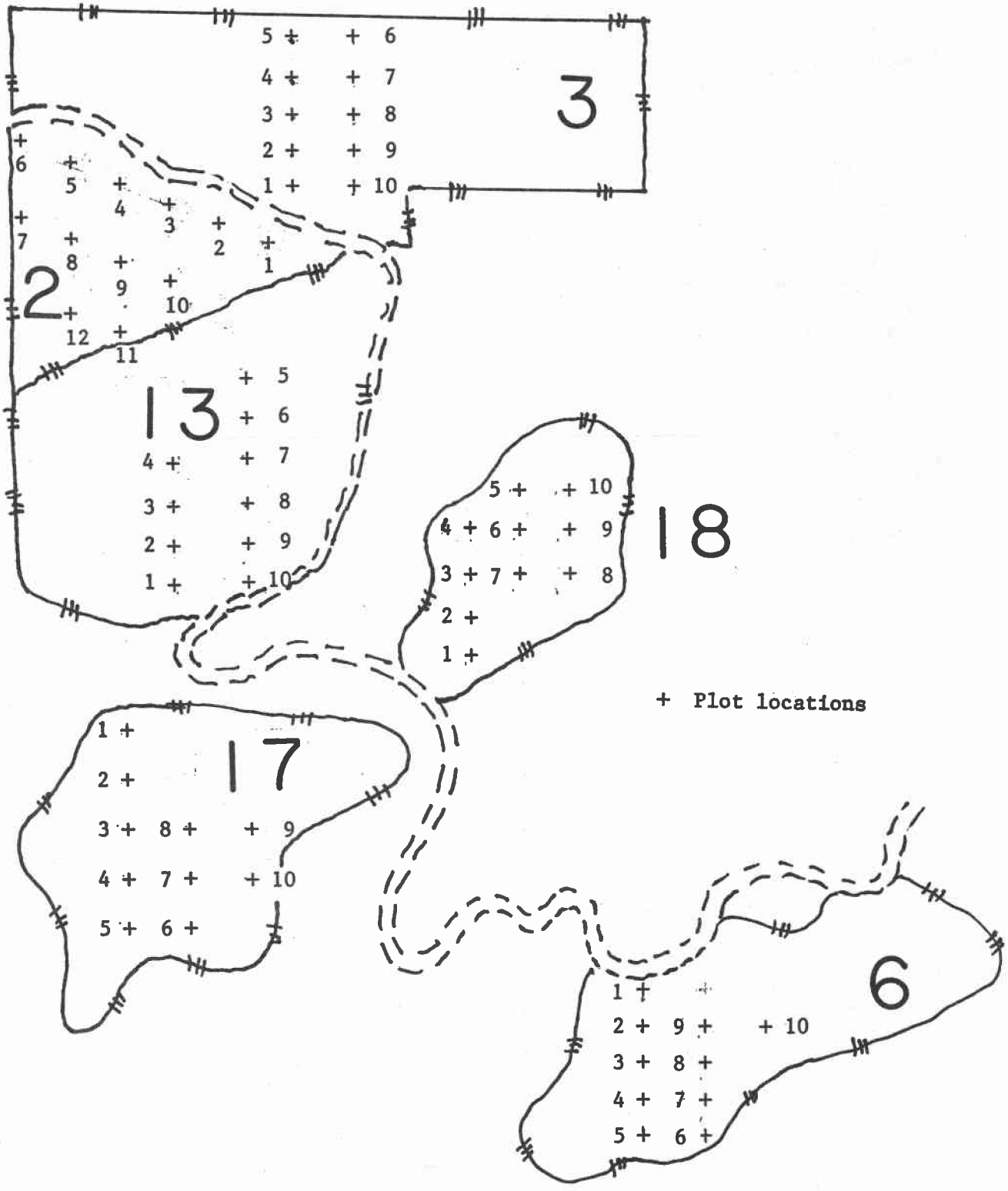
Table 4.--Posttreatment trees per acre stocking level.

	Stand ident.	Gallatin National Forest Trees per acre by species				
		DF	S	SAF	LPP	Total
Check	02	599.7	58.2	244.0	128.0	1029.9[1]
Group selection	03	293.7	0	150.0	13.8	456.8
Clearcut	06	150.0	0	0	0	150.0
Shelterwood	13	472.0	0	0	0	472.0
Shelterwood	18	286.7	30.0	60.0	120.0	496.7
Overstory removal	17	369.9	0	148.8	113.0	631.8

[1]Additional plots and different systematic grids were used when posttreatment plots were established.

Figure 2

Location of permanent sample plots



INSECT CONDITIONS

Each year from 1981 to 1985, western spruce budworm larvae have been sampled during the late instar period in each block on four height classes of host trees. Host classes were 0-2 feet; 2-6 feet; 6-30 feet; 30-60 feet. At each of 10 sample points from the four tree classes, two 18-inch branches were removed and spruce budworm larvae were counted. Not all tree classes were present at each point. This was especially more pronounced after the harvest cuts. On smaller trees, the branches were not cut but the entire tree was used as the sample stratum. Population levels were displayed as spruce budworm per 100 new shoots.

RESULTS TO DATE

There seems to be a slight increase in populations in the cut blocks when compared to the check block. This may be the result of crown development; that is, new shoots are longer and can support more budworm per shoot compared to more dense stands. Defoliation intensities have not been at the level where growth depression or top killing is expected, therefore, no assessment on these measurements has been made. Population levels reflect late instar densities. All larval sampling was done at approximately the same week each year (Table 5).

Table 5.--Larval densities per 100 shoots by tree class by year.

		Tree size class in ft.				
	Stand	0-2	2-6	6-30	30-60	Average
	02	0	1.28	8.21	2.62	3.03
1981	03	0	0	1.31	.60	.48
Pretreatment	06	0	0	1.48	1.07	.64
	13	0	0	3.08	2.85	1.48
	17	0	.61	.74	4.85	1.55
	18	0	10.55	3.76	3.79	4.53
Average		0	2.07	3.10	2.63	1.95
	02	0	5.87	3.09	9.53	4.62
1982	03	0	4.58	7.98	15.84	7.10
Year cut	06	Clearcut no trees				
	13	2.17	15.54	10.47	2.94	7.78
	17	2.27	2.03	6.90	5.07	4.07
	18	0	.48	2.70	3.06	1.56
Average		0.89	5.70	6.23	7.29	5.03

Table 5.--Larval densities per 100 shoots by tree class by year, cont.

		Tree size class in ft.				
	Stand	0-2	2-6	6-30	30-60	Average
	02	0.45	4.77	4.80	2.76	3.20
1983	03	.11	2.86	4.25	4.85	3.02
Posttreatment	06	Clearcut no trees				
	13	0	6.25	6.44	5.40	4.52
	17	0	5.37	7.13	4.93	4.36
	18	1.10	5.16	11.73	9.60	6.90
Average		0.33	4.88	6.87	5.51	4.40
	02	.45	.52	1.89	1.64	1.13
1984	03	0.00	1.99	1.92	3.01	1.73
Posttreatment	06	Clearcut no trees				
	13	0.00	0.00	5.13	6.99	3.03
	17	0.00	4.12	2.94	5.32	3.10
	18	.11	1.04	2.86	4.95	2.24
Average		0.11	1.53	2.95	4.38	2.24
	02	.00	.95	1.71	2.76	1.36
1985	03	.00	1.55	2.46	5.21	2.31
Posttreatment	06	Clearcut no trees				
	13	.00	-	1.68	4.81	2.16
	17	.00	3.92	4.51	5.03	3.37
	18	.00	1.21	3.39	6.25	2.71
Average		.00	1.91	2.75	4.81	2.38

Populations of late instar larvae were noticeably lower on the smaller trees (fig. 3). Feeding was often present but larval populations were nearly absent. This confirms other reports and supports research findings that predation of spruce budworm occurs more frequently on small trees and at the lower crown levels.

Future plans are to continue monitoring the population and to evaluate the decision support system developed by CANUSA which includes a spruce budworm population and damage model. Permanent sample plots in the Lolo NF stands will be established and monitored in 1986.

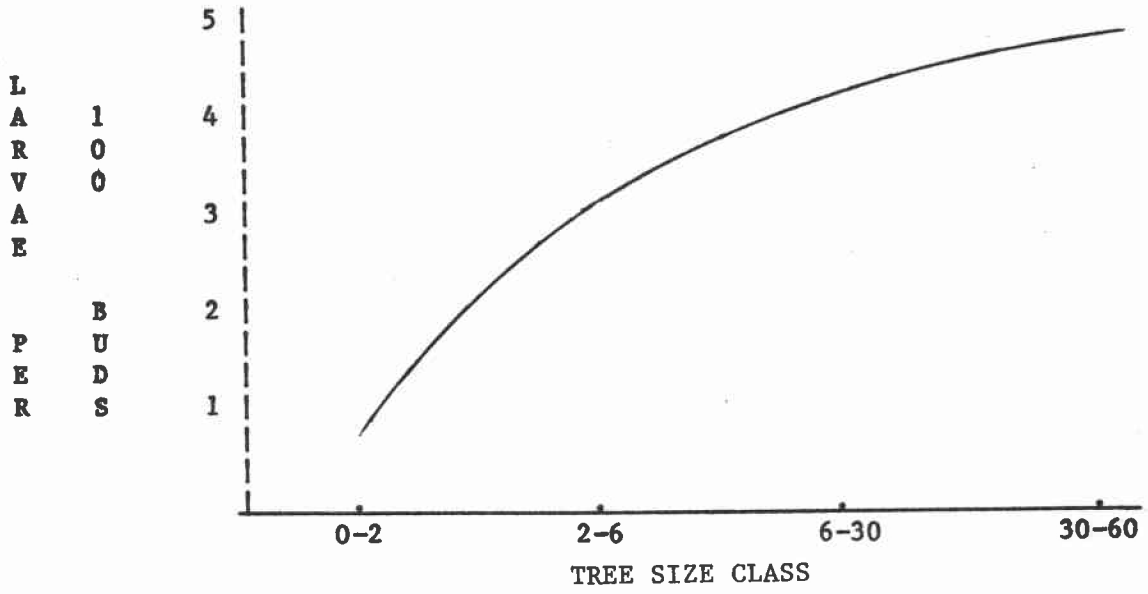


Figure 5.--Relationship of larval density to tree size class for all blocks.

LITERATURE CITED

Bousfield, Wayne, N. William Wulf, and Lawrence E. Stipe. 1983. Establishment report on the western spruce budworm silvicultural project on the Gallatin and Lolo National Forests, Montana. USDA Forest Service, Cooperative Forestry & Pest Management, Missoula, MT. Rept. 83-18.